Globalization and the Labor Share of Income in the United States

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Abstract

This paper examines the effects of globalization on the labor share of income in the United States. We first discuss the channels through which globalization may affect the labor share. We then conduct empirical analysis of 18 U.S. manufacturing industries and find that globalization's impact on the labor share is multi-dimensional. Some indicators of globalization have a negative effect on the labor share, while others have a positive effect. For example, an increase in foreign direct investment (FDI) outflows from the United States has a negative effect on the labor share, as does an increase in import penetration. However, an increase in the export share of total domestic shipments has a positive effect on the labor share. We also find that total-factor productivity (TFP) growth has a negative effect on the U.S. labor share, suggesting there has been a shift toward labor-saving technology in the United States. A particularly interesting finding is that an increase in employment in U.S. affiliates abroad (relative to the employment in their U.S. parents) yields a modest net increase in the labor share in two years, though not in the first year.

Since labor is mobile in the domestic economy over the long run, the impact of globalization on the employment and wages in the tradable sectors will necessarily have spill-over effects on the rest of the economy. Thus, although the share of manufacturing output in the U.S economy has fallen to about 12 percent recently, our findings are relevant for understanding the impact of globalization on the aggregate labor share.

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1. Introduction

How national income is divided between labor and capital has been a subject of interest to economists, especially to those in the tradition of classical economics.[1] In part, that interest was rooted in the concern that an unsustainable distribution of income could threaten the stability of an economic system. For most of the past half-century, however, research interest in the issue waned as the labor share rose to a high and relatively stable level in industrial countries. For most researchers, the urgency of the issue ended with Kaldor's (1957) observation that the shares of national income received by labor and capital are roughly constant over a long period of time.

The distribution of income between labor and capital has again been the focus of much attention over the past two decades, however, in part because the stability of the labor share appears to have been trending down among industrial countries since the early 1980s. In the United States, that decline is smaller than in most other industrial economies through 2000; since then, however, the U.S. labor share has been on a steadily decline.

On the political-economy front, this development catches attention because it is likely to have negative implication on social cohesiveness and even political stability. On the analytical front, the development also poses two major challenges to economists. First, it means economists can no longer safely assume that a Cobb-Douglas production function with constant coefficients is a reasonable approximation for the aggregate economy.[2] Second, it means economists can no longer assume that the labor share will revert to its long-run average after some short-run

[1] For example, see Smith (1776), Ricardo (1817), Keynes (1939), Kuznets (1933, 1959, 1966), Johnson (1954), Solow (1957, 1958), Kaldor (1961), Kravis (1962, 1968).
[2] For example, see Karabarbounis and Neiman (2012).

fluctuations; this in turn will increase the uncertainty of government budget projections, since the components of labor income are taxed at rates different from those of capital income.

For those reasons, there is a growing interest among researchers of different stripes to ask several related questions: Is there really a trend decline in the labor share since the late 1970s, or was it just a return to the "normal" from its unsustainable high level in the 1960s? If indeed there is a long-term decline in the labor share in most advanced countries, is it mainly driven by the rapid rise in globalization (including labor migrations, trade flows, cross-border investments, offshoring of services, and integration of global supply chains), as alleged by many? Or, was it mainly due to the technology shift toward labor-saving production?

Those who are view globalization as an important contributor for the decline in the labor share have made the following arguments.[3] First, imports from low-wage countries have risen rapidly since the early 1980s, lowering U.S. firms' price competitiveness in labor-intensive products. This development means the reality is now closer to the scenario in Stolper and Samuelson (1941) predicted in the Heckscher-Ohlin framework: both the real wage and labor's share in the capital-abundant country will decline when it trades with a labor-abundant country. [4] Second, increased capital mobility not only allowed firms to move their production abroad more easily but also increased capital owners' bargaining power in wage negotiations, thereby slowing the growth of jobs and wages in the home countries. Third, U.S. industries have increasingly been tapping lower-wage labor abroad through the global-supply chain, which may have eroded job growth in the United States in the short run and suppressed wages paid to U.S. workers in the

[3] For example, see Rodrik (1997), Feenstra (2010), Spence and Hlatshwayo (2011), and Alpert et al. (2011).

[4] Despite the elegance of the Stolper-Samuelson Theorem, the majority of the early empirical research found that increased international trade did not significantly affect the distribution of income between labor and capital. Economists have attributed the lack of empirical support for the theorem to the fact that the bulk of industrial economies' trade were intra-industry trade with other industrial economies, not inter-industry trade with countries of vast differences in factor endowment.

long run. Although the number of economists sympathetic to this view has grown in recent years, some economists disagree that globalization is a major culprit for the fall in the labor share.[5]

Against this backdrop, this paper examines the impact of globalization on labor share of income in the United States. This paper first discusses the theoretical channels through which globalization affects the labor share. We then conduct the empirical estimation of the effect of globalization on the labor share in manufacturing. Our empirical findings are relevant for understanding the impact of globalization on the aggregate labor share, even though the share of manufacturing output in the U.S economy has fallen to about 12 percent of GDP in 2011 (from about 23 percent in 1970). Because labor is mobile in the domestic economy over the long run, the impact of globalization on the employment and wages in the manufacturing sector will necessarily have spilled-over effects on the rest of the economy. In the U.S. case, where the entire manufacturing sector is shrinking partly due to globalization, most workers released from manufacturing will move to lower-paying jobs in other sectors.

Our empirical results suggest that globalization has influenced the labor share in manufacturing. Using a dataset comprising 18 three-digit industries over the period from 1999 to 2009, our empirical estimation suggests that, while some indicators of globalization have a negative effect on the share of labor compensation in the value-added, others have a positive effect. For example, an increase in foreign direct investment (FDI) outflows from the United States has a negative effect on the labor share, as does an increase in import penetration (i.e., the share of imports in the domestic market). However, an increase in the export share (i.e., the share of exports in total domestic shipments) has a positive effect on the labor share. We also find that total-factor productivity (TFP) growth has a negative effect on the labor share, suggesting there

[5] Economists skeptical of globalization's role in the rise in income inequality include Bhagwati, et al. (2004) and Lawrence (2008).

has been a shift toward labor-saving technology in U.S. manufacturing.[6] A particularly interesting finding is that an increase in employment in U.S. affiliates abroad (relative to the employment in their U.S. parents) yields a modest net increase in the labor share in two years, though not in the first year. This result suggests that the offshoring of low-skilled jobs not only improves the pay of those high-skilled jobs retained at the parent companies, but also creates other better jobs at home over time.

The organization of the rest of this paper is as follows. Section 2 describes the decline in the labor share since 1980 and discusses the channels through which globalization may lower the labor share of income. Section 3 reviews studies of other factors that may also influence the labor share. Section 4 reports the estimation method and discusses empirical results. Section 5 concludes.

2. The Decline in the Labor Share and the Rise of Globalization

The share of labor income in Gross Domestic Product (GDP) in the United States started to show a downward trend much later than that in most other industrial economies. The U.S. labor share remained relatively stable from the mid-1970s to the end of 1980, even as the average labor share in the major industrial economies has been declining noticeably during that period (Figure 1 and Table 1).[7] Since the early 1990s, the U.S. labor share started to decline

[6] Labor-saving technical change is biased toward using less labor for a given amount of output. Under the assumption that the elasticity of substitution between capital and labor is less than one, labor-saving technical progress leads to a decline in the labor share. Several other papers also find that technical change has lowered the labor share. For example, see Bentolilla and Saint-Paul (2003), Guscina (2006), Ellis and Smith (2007), and Jayadev (2007).

[7] Aggregate labor income in an economy is the sum of compensation received by employees and the labor portion of income generated by self-employed. Employee compensation is the sum of wages and salaries and supplemental benefits (such as employers' payments for health and other insurance premiums, their share of payroll taxes for Social Security and Medicare, and their contributions to pension funds). Wages and salaries paid directly to employees are the largest component of aggregate labor income, representing roughly 74 percent in 2010.

more noticeably, but that decline is still milder than the decline in average labor share among the rest of G7 countries between 1992 and 2008.[8]

However, the relative stability of the U.S. labor share masks the much sharper decline in the U.S. manufacturing's labor share (Figure 2). From 1987 to 2010, the share of labor's compensation in manufacturing's value-added fell by 17 percentage points (from 67.8 percent to 51.0 percent), while the aggregate labor share fell by 3 percentage points (from 62.3 percent to 59.6 percent). The sharp decline in labor's share in manufacturing was attended by a decline in employment, suggesting that the average wage in manufacturing either has declined or has not risen by enough to offset the decline in employment (Figure 3).

In the literature, the relentless decline in manufacturing's labor share has been mainly attributed to globalization and/or progress in labor-saving technology. This section discusses theoretical channels through which globalization may influence the labor share: the Stolper-Samuelson channel, the rent-sharing channel, and the technology-shifting channel.

2.1 The Stolper-Samuelson Channel

Using the Heckscher-Ohlin framework, which assumes perfect competition in both product and labor market (among other assumptions), Stolper and Samuelson (1941) demonstrate that the labor share in a capital-abundant country will decline after trade. The decline occurs not just in the short run when workers released by the shrinking industries are not yet absorbed by the expanding industries, but also *in the long run when all labor and capital are fully employed.* Chiefly, this is because a reduction in the production of labor-intensive output will lead to the

[8] The steep post-2008 recession apparently helped to boost the labor share in most of those industrial countries, even though it did not do so in the United States. That difference may be in part due to a higher degree of labor market rigidity in those foreign countries, and in part due to the steeper recession in those countries than in the United States.

release of more labor than can be re-employed *at the initial wage* in the production of capital-intensive goods. In order for all workers to be employed, the real wage needs to fall in both the expanding (comparative-advantage) and shrinking (i.e., comparative-disadvantage) industries, so that the former will expand enough to absorb the labor released by the decline in the latter.

The Stolper-Samuelson effect does not predict that international trade *per se* will lower the labor share of income. What it predicts is that international trade driven by differences in factor endowment will trigger a reallocation mechanism to lower the income share of the scare factor in each country. While it is debatable whether labor in the United States is the scarce factor in its trading with other advanced economies, no one disputes that labor in the United States is the scarce factor in its trading with emerging economies. Thus, if the Stolper-Samuelson effect partially responsible for the decline of the labor share in the U.S. manufacturing sector, we ought to observe a necessary conditions: imports from low-wage countries have been rising as a share of total imports during the period the labor share in the U.S manufacturing sector is declining. Data suggest that indeed is the case. From 1989 to 2010, the share of U.S. imports from non-OECD countries rose from 29 percent to 46 percent, with China accounting for a significant amount of that rise; meanwhile, the labor compensation share in the manufacturing sector fell from 65 percent to 51 percent (Figure 4).

The reallocation mechanism illustrated by the Stolper-Samuelson theorem also operates in response to the rise in foreign direct investment (FDI) and offshoring. For example, as more developing/emerging economies allowed flows of foreign direct investment, many U.S.-based multinational companies have increasingly moved their production to those countries to tap their lower-cost labor, as well as to position themselves in those growing markets. From 1999 to 2009, the ratio of employment in the U.S. foreign affiliates to U.S. parents in the manufacturing

sector rose from 25.1 percent to 38.7 percent (see Table 2). Holding constant the demand for the products of those U.S.-based companies, the jobs created by their foreign affiliates are the jobs lost in the United States. If the global market for those multinationals' product does not grow in tandem, those American workers displaced by foreign workers in this fashion will need to find jobs in other firms or industries.[9] The average wage of those displaced workers will then need to fall in order for them to be absorbed by other firms or industries because, everything else being equal, that direct investment outflow leads to a lower capital/labor ratio in this country.

Empirical evidence of the Stolper-Samuleson effect has grown somewhat stronger in recent years. For example, Harrison and McMillan (2011) find evidence suggesting that some parent firms have reduced employment in the United States as they or other U.S. parent firms increased employment abroad through the establishment and expansion of foreign affiliates. Jaumotte and Tytell (2007), using data for 18 advanced countries from 1982 to 2002, also find evidence of Stolper-Samuelson effect at work. However, because the negative effect of falling import prices on the labor share is partially or (in some cases) completely offset by the positive effect of falling export prices on the labor share, international trade plays only a minor role in the decline of labor's income share. Ebenstein et al. (2009), using data between 1982 and 2002, find evidence of the Stolper-Samuleson effect caused by offshoring as well as that caused by international trade. Even though they confirm a common finding (by that time) that an increase in offshoring or import penetration has a negligible effect on wages of manufacturing workers, they find that occupational exposure to globalization is associated with larger wage

[9] Of course, if the rise in that employment ratio mainly results from an increase in employment in foreign affiliates to meet growing demand from abroad, then the rise in that ratio would not necessarily hurt U.S. workers.

effects than is industry exposure. By their estimation, there were wage losses of 2 to 4 percent among workers leaving manufacturing and 4 to 11 percent among workers who also switch occupations. They also find that offshoring has a discernable negative impact on U.S. wages. More recently, Autor, Dorn and Hunson (2011) explore the effect of import competition on U.S. labor markets that were differentially exposed to the rise of China trade between 1990 and 2007 due to differences in their initial patterns of industry specialization. The authors find that increased exposure of local labor markets to Chinese imports leads to higher unemployment, lower labor force participation, and reduced wages. The employment reduction is concentrated in manufacturing and explains one-third of the decline in U.S. manufacturing employment between 1990 and 2007. Moreover, they find that wages declined in the broader local labor market, particularly outside of manufacturing.

2.2 The Rent-Sharing Channel

In an imperfect-competition model where there is rent (excess profits) to be divided between capital owners and labor, globalization can depress the labor share of income in advanced economies by eroding labor's bargaining power relative to capital owners. That occurs mainly because the rise in FDI mobility and offshoring technology allows firms to threaten to move their operations abroad. With labor's bargaining power weakened, globalization could further lower the labor share for two related reasons. First, globalization increases the rent accrue to firms that have special know-how via increasing the market size for those unique products that do not have close substitutes (such as the iPad in the initial periods of its launch) while decreasing the assembly cost of those products (by tapping the global supply chain). Thus, to the extent that those firms can limit the compensation of their domestic employees to a margin over

compensation to employees in other domestic firms, a greater share of that rent goes to capital owners. Second, the rise in global competition would tend to compel firms to retain much of the increase in rent for research and innovation to stay globally competitive.

Casual empiricism roughly suggests that the waning of labor's bargaining power has coincided with the rise in offshoring and in FDI outflows. The decline in unionization (in the overall economy) has become more rapid since the mid-1980s just as offshoring and FDI outflows from the United States to low-wage countries have risen. Between 1983 and 2010, unionization fell from 20 percent to 12 percent; meanwhile, the FDI outflows/GDP ratio increased from 0.4 percent to 2.4 percent (Figure 5).[10] The decline in unionization from 1999 to 2009 also coincided with the rise in the ratio of employment in U.S.-owned foreign affiliates relative to employment in their parents (Table 2): that ratio rose from 25.1 percent to 38.7 percent, while the degree of unionization fell from 13.9 percent to 12.3 percent.[11]

Some econometric evidence also supports the rent-sharing channel. For example, Harrison (2002) finds evidence suggesting that the labor share increases with the difference between foreign and domestic returns to labor and the cost of moving capital abroad. In other words, the labor share is higher when foreign returns to labor increase (so that capital owners' bargaining power decreases). Relatedly, both Harrison (2002) and Jayadev (2007) find that *de jure* openness to capital flows is associated with a lower labor share in both rich and poor

[10] Because earnings "distributed" to U.S. parent companies from foreign subsidiaries are treated as a decline in FDI outflows in the balance-of-payment accounting, the sharp drop in FDI outflows in 2005 mainly reflected the effect of tax holiday granted by the American Jobs Creation Act (AJCA) of 2004. AJCA allowed repatriated foreign profits to be taxed at a maximum rate of 5.25 percent provided they are used to stimulate investment in the United States. Businesses had a one-year window (which closed in 2005 or 2006, depending on the company) to take advantage of the lower tax.

[11] The rise in that ratio reflects both the rise in employment in foreign affiliates and a decline in employment in American parent companies. From 1999 to 2009, the number of workers employed by US-owned foreign affiliates increased by 5 percent, from 4,357,000 to 4,587,000.

countries.[12] These results are consistent with Harrison's (2002) hypothesis that allowing capital to move abroad more easily weakens labor's bargaining position and thus erodes the labor share. Both Harrison (2002) and Guscina (2006) also find *de facto* measures of openness to capital flows are negatively and significantly associated with the labor share. Harrison and McMillan (2004), also using a framework of imperfect competition, test the validity of the "neighbor" effect – i.e., whether U.S. workers in other plants are being threatened by plant relocation.[13] Their findings, based on the operations of U.S. multinationals in the manufacturing sector, suggest that increased capital mobility has had some negative labor market outcomes.

2.3 The Technology-Shifting Channel

Globalization can also influence the labor share of income by enabling or inducing innovations in production or process technology. It could help enable technical innovation if each firm's level of technology depends on the aggregate stock of all firms' knowledge as in Romer (1986).[14] From this perspective, an increase in international exposure could raise domestic firms' productivity growth by expanding the aggregate stock of knowledge to include those of foreign competitors. Globalization can also induce innovations through competitive pressures. As long as labor costs are higher in America than in most other countries, a rise in

[12] The *de jure* measure of openness indicates whether or not the country imposes restrictions on capital flows. The *de facto* measure indicates how much capital flows in and out of the country.

[13] They hypothesize that firm relocation to developing countries is more likely to put downward pressure on U.S. wages than relocation to other industrialized countries. They then test whether workers in U.S. auto plants are forced to accept lower wages when other U.S. plants relocate some of their auto operations to lower-wage countries abroad. They do so by distinguishing between the threat effect of affiliate activity in Europe, where wages are comparable, with activity in Mexico or other developing countries.

[14] In this case, the production function of firm i is characterized as $Y_i = A(R)F(K_i,L_i,R_i)$, where Y_i, K_i, L_i, and R_i are respectively output, capital input, labor input, and the stock of knowledge of firm i, while R is the aggregate stock of knowledge in the economy.

international competition will spur American firms to adopt labor-saving production/process technology in order to minimize production costs and stay competitive.

While the enabled or induced technology shift tends to increase wages of skilled workers, it also tends to lower wages of unskilled workers.[15] In the short run, the new technology reduces the employment of unskilled workers in firms that have acquired the technology, thereby lowering the labor share of value-added in those firms. In the long run, when real wages adjust to restore full employment as in the neoclassical framework, the aggregate labor share will also decline if the rise in the total income of skilled workers is not sufficient to offset the decline in the total income of unskilled workers.

To illustrate, consider a simple model economy with only two sectors – the tradable sector and the non-tradable. The economy has two groups of workers—Group 1 work in the tradable sector and Group 2 work in the non-tradable sector. The number of workers in Group 1 is $\boldsymbol{T}$, their average real wage is $\boldsymbol{w^T}$, and their total labor income is $\boldsymbol{Tw^T}$. The number of workers Group 2 is $\boldsymbol{N}$, their average real wage is $\boldsymbol{w^N}$, and their total labor income is $\boldsymbol{Nw^N}$. Now assume the tradable sector acquires a labor-saving technology, but not the non-tradable sector. Moreover, only a portion of Group 1 workers acquires the new skills to work with the new technology. The number of workers who attain the new skills is $\boldsymbol{sT}$, and the number of workers who do not acquire the new skills is $\boldsymbol{(1\text{-}s)T}$, where $\boldsymbol{0 < s < 1}$.

Using a neoclassical framework, we can infer the impact of the above-mentioned labor-saving technology on the aggregate labor income in this setting as follows:

[15] The rapid progress in information and communications technology has stimulated capital accumulation and favored skilled labor—with which it is more complementary—over unskilled labor. For example, see International Monetary Fund (2001).

(1) After the technology shift, the average real wage of those attained the new skills in Group 1 (w^S) will be greater than w^T. The average real wage of those who did not attain the new skills (w^U) will not only be lower than w^T but also lower than w^N. Or,

   a. $w^S > w^T$: the average wage of the skilled workers will rise relative to the average wage in the tradable sector because their productivity has risen;

   b. $w^U < w^N < w^T$: the average wage of all unskilled workers (in both the tradable and non-tradable sector) will fall below w^N so that the non-tradable sector can expand by enough to absorb unskilled workers released from the tradable sector.

(2) The total labor income of Group 1 now becomes $sTw^S + (1-s)Tw^U$, compared to Tw^T before the technology shift. Thus, if $sTw^S + (1-s)Tw^U < Tw^T$, the total labor income of Group 1 will fall following the technology shock.

(3) From (2), the labor income of Group 1 falls after the shock if $s(w^S - w^U) > (w^T - w^U)$; it rises if $s(w^S - w^U) > (w^T - w^U)$. Thus, the total labor income of Group 1 *could either rise or decline* after the technology shift, even though sT of them will experience an increase in income.

(4) The total income of Group 2 workers has now fallen because $Nw^N < Nw^U$.

(5) The aggregate labor income of the economy in the long run, when all those released by the tradable sector are absorbed in the non-tradable sector, becomes $sTw^S + (1-s)Tw^U + Nw^U$, compared to $Tw^T + Nw^N$ before the shock.

(6) The change in aggregate real income after the technology shock (= $sTw^S + (1-s)Tw^U + Nw^U - Tw^T + Nw^N$) is positive, if $sT(w^S - w^U) > T(w^T - w^U) + N(w^N - w^U)$, and negative if $sT(w^S - w^U) < T(w^T - w^U) + N(w^N - w^U)$. In other words, the aggregate

labor income will rise after the technology shock only if the real income gain of those skilled workers is sufficiently large to outweigh the real income loss of all the rest of workers in the economy.

(7) If we assume $s(w^S - w^U) = (w^T - w^U)$, ***i.e.*** the labor income of Group 1 stays unchanged after the shock, then the aggregate labor income will unambiguously fall because $Nw^N < Nw^U$.[16]

(8) The likelihood that $sT(w^S - w^U)$ is greater than $T(w^T - w^U) + N(w^N - w^U)$ is a positive function of s. That is partly because in increase in s not only increases sT directly, and partly because a rise in s reduces the number of unskilled workers that need to be absorbed in the non-tradable section, thereby reducing the size of $(w^T - w^U)$ and $(w^N - w^U)$.[17]

The above simple model illustrates why a technology progress that initially occurs in one sector of the economy could lead to a fall in the economy-wide labor share, even if the total value-added does not increase following the technology progress. (If the total value-added rises following the technology progress, the fall in the labor share will be even larger.) Importantly, the above illustration also indicates that a technology shift is more likely to increase the labor share if a sufficiently large segment of workers attains the new skills.

Work by Spence and Hlatshwayo (2011) suggests that the labor-saving technology innovations in the U.S. that were induced, or enabled, by globalization have contributed to the

[16] To help get a sense of how likely the total income of Group 1workers will fall after the technology shift, as sume s = 40%. In this case, if the rise in the wage of skilled workers equals the fall in the wage of unskilled so that $(w^S - w^U) = 2(w^T - w^U)$, it is straightforward that $s(w^S - w^U) = 40\% * 2(w^T - w^U) < (w^T - w^U)$, a condition leads to the decline in the total income of those T workers. But if $(w^S - w^U) = 3(w^T - w^U)$, then $s(w^S - w^U) = 40\% * 3(w^T - w^U) > (w^T - w^U)$, a condition leading to the rise in the total income of Group 1 workers.

[17] When s =1, the technology shock becomes a labor-augmenting technology shift, which increases the labor share under the typical neoclassical assumptions.

decline in the labor share through the mechanism illustrated in our simple model. According to those authors, the rapid rise in offshoring and the global supply chain are examples of how globalization has pushed and enabled the change in the production process – namely, by offshoring the less productive segments of its production chain—that reduced the employment and real wage of unskilled workers in the tradable sector. Those new forms of globalization allow tradable industries to move up the value-added chain by shifting the low and middle parts of the production chain – those with lower value-added per employee (VAP) – to emerging economies. (The global supply chain allows industries to take advantage of lower-cost labor abroad, without having to set up their own affiliates in those countries, to cut their production costs and increase their price competitiveness.) When a tradable industry moves the production segments of lower VAP offshore, it increases the productivity of the operations that it retains by decreasing employment in that industry. Although the average wage will rise in those industries along with the increase in productivity and the shedding of less productive workers, the displaced workers tend to move to jobs in the non-tradable sector that pay even less than their previous jobs in the lower-VAP component of the tradable industries.[18]

Findings by Jensen (2011) complement those of Spence and Hlatshwayo (2011) on the role of productivity in manufacturing. He points out that, over the past 40 years, the U.S. manufacturing sector experienced strong labor productivity growth relative to aggregate U.S. productivity growth. Between 1970 and 2007, output per worker tripled in the manufacturing sector, while that in the economy as a whole grew only by 50 percent. The dramatic increase in

[18] Spence and Hlatshwayo point out that, in 1990, VAP in the tradable sector ($80,000) was only about $10,000 above VAP the non-tradable sector. But the VAP in both sectors diverged slowly during the 1990s and then rapidly after 2000. VAP in the tradable sector grew at an average of 2.3 percent annually, and the non-tradable sector at 0.7 percent. By 2008, VAP in the tradable sector was over 50 percent above that for the non-tradable sector.

labor productivity in manufacturing explains both the strong growth in output and the part of the decline in employment in that sector.

Those two papers, together, lend support to the view that globalization, by providing the impetus to shift U.S. manufacturing toward labor-saving technology, has contributed to the decline of employment in the (higher-VAP) tradable sector and the rise of employment in the (lower-VAP) non-tradable sector. Those developments, in turn, are a major factor underlying the decline in labor share of income in the United States.

3. Other Determinants of Labor's Income Share

Researchers have also investigated other factors that may influence the movement in the labor share, most notably technical change, labor-market institutions, and the business cycle. One should note, however, determinants of the labor share could influence each other. It is widely accepted that progress in information technology helps spread and speed up globalization. We already discussed how globalization can induce a shift a technology in Section 2. The papers reviewed in this section also suggest that the effect of technical change on the labor share depends on labor-market institutions, as does the effect of the business cycle on the labor share.

3.1 Technical Change

Theories of why technical change and the relative return to factors may affect each other first sprang up in the 1960s in response to Kaldor's (1957) observation that the distribution of national income between labor and capital are roughly constant over a long period. To some economists – for example, Fellner (1961), Kennedy (1964), and Samuelson (1965) – it is far more plausible to argue that innovations will be induced by changes in factor prices to keep the factor share of income constant than to assume that the elasticity of substitution between labor

and capital equals one in the aggregate production function (as embedded in the Cobb-Douglas production function). Subsequent research shows that, under the assumption of full employment and that product and factor prices are fixed, a labor-augmenting technical change will lead to a rise in the labor share.[19] That is because, under those assumptions, a labor-augmenting technical progress results in more efficiency units of labor, with each unit paid the same wage as before. By the same reasoning, capital-augmenting technical progress will result in a decline in the labor share.

However, as noted by Harrigan and Balaban (1999), those assumptions are not appropriate for a large economy with a large non-traded sector such as the United States, where prices will be endogenous in response to changes in factor supplies, technology, and other domestic and international influences on relative demand and supply. In the short run, when full employment cannot be safely assumed, a labor-augmenting technical progress amounts to a labor-saving change – a change that tends to result in a decline in the labor share, as discussed in Section 3.

Recent studies have tended to find that technical change lowers the labor share, especially after 1985. Guscina (2006), using GDP per worker to gauge productivity, finds that the relationship between productivity and the labor share was positive prior to 1985 but negative after 1985. Ellis and Smith (2007), who use a linear time trend (since 1985) to proxy technical change, find the coefficient on the time trend remains negative and significant after they include a host of other independent and control variables in their regressions. They interpret their results as evidence that technical change has eroded the labor share. Bentolilla and Saint-Paul (2003)

[19] Labor-augmenting technology change refers to the change that increases the productivity of labor so that it effectively increases the quantity of labor in the production function. Acemoglu (2003) offers two ways of thinking about labor-augmenting technical progress: as the introduction of new production methods that directly increase the productivity of labor, or as the introduction of new goods and tasks that use labor.

find that technical progress, as measured by the Solow residual, is negatively related to the labor share. Jaumotte and Tytell (2007), who measure technology as the share of information and communications technology (ICT) in the total capital stock, find that technical change lowered labor share in most OECD countries, though it boosted the labor share in the United States. Jayadev (2007), using output per worker as a measure of productivity, finds a negative correlation between labor productivity and the labor share.

3.2 Labor-Market Rigidity

One strand of literature emphasizes the way labor-market rigidity accentuates the degree to which technical progress changes the labor share. Another strand of literature invokes labor-market rigidity to explain the counter-cyclical behavior of the labor share.

3.2.1 Interaction of Labor-Market Rigidity and Technical Progress

The most notable paper in this area is that by Hornstein, Krusell, and Violante (2007), subsequently referred to as HKV. HKV hypothesize that, in the context of a labor market with frictions, a capital-embodied technical innovation (the type of technical change that has represented the major source of output growth in the industrial world since the 1970s) may have reduced firms' incentives to create new jobs, thereby increasing unemployment and reducing the labor share.[20] In that model, labor-market rigidity exacerbates the long-run creative-destruction effect of a capital-embodied productivity shock on unemployment. That is, an acceleration in capital-embodied technical change reduces labor demand more in economies with rigid institutions, or under policies that increase that rigidity. *Ceteris paribus*, higher unemployment

[20] Capital-embodied technical change means that the productivity of a unit of capital already installed is fixed, but capital installed later will be more productive than that installed previously. Such a setup is sometimes referred to as "vintage capital" or "putty-clay."

insurance benefits, firing costs, or hiring subsidies will raise the labor share. The model thus provides an explanation of why Europe, with a relatively rigid labor market, has seen the labor share fall significantly, while the United States and the other countries with a relatively flexible labor market (such as the United Kingdom, Canada, and Australia) has seen a much smaller drop in the labor share.

So far, no clear conclusions have emerged from cross-country evidence on the relationship between labor market institutions and the labor share. For example, Guscina (2006) and Jaumotte and Tytell (2007) find that union density (percentage of workers who belong to labor unions) is not significantly related to the labor share, while Jayadev (2007) finds that union density is positively correlated with the labor share in a sample of OECD countries. Those results may reflect that fact that union density actually embodies two latent variables – barrier-to-entry and labor's negotiation power in collective bargaining – that have opposing effects on the labor share. As a proxy for the barrier-to-entry, an increase in union density has a negative effect on the labor share through the channel theorized by HKV. However, as a proxy for labor's bargaining power, an increase in union density has a positive effect on the labor share. Thus, the net effects of those two latent variables could be quite different in different studies that use different sample countries and periods.

Evidence regarding the relationship between the labor share and employment protections is also mixed. Ellis and Smith (2007) find that the labor share was negatively related to employment protection for a sample of 19 industrialized countries over the period 1960 to 1995. Guscina (2006) finds that the relationship was positive prior to 1985, and not statistically significant afterward. Jaumotte and Tytell (2007) also find evidence supporting the claim that

there was no significant relationship between the labor share and employment protection from the 1980s onward.

3.2.2 Interaction of Labor-Market Rigidity and the Business Cycle

Several papers – including Young (2004), Rios-Rull and Santaeulalia-Llopis (2009), Whelan (2007), and Bantini et al. (2000, 2007) – have found that the labor share is counter-cyclical. Theoretical explanations of the counter-cyclical behavior of the labor share, such as Giammarioli et al. (2002) and Choi and Rios-Rull (2008), tend to rely on the presence of labor-market rigidities.

Giammarioli et al. (2002) consider labor market rigidities arising from policies intended to protect employment. They note that firing costs or other such restrictions on firms' employment decisions will induce optimizing employers to hire fewer workers during booms and lay off fewer workers during recessions. Such labor hoarding behavior means that aggregate labor income will vary proportionally less than output, resulting in a countercyclical labor share. Consequently, their analysis implies that the liberalization of labor markets will reduce the volatility of the labor share over the business cycle, since firms will engage in less labor hoarding.

Choi and Rios-Rull (2008) attempt to explain the counter-cyclical behavior of the labor share by introducing labor-market frictions into a standard real business cycle (RBC) model. They argue that, with labor market frictions, firms cannot instantly hire more workers in response to a positive productivity shock. Rather, vacancies are filled gradually at a rate determined by the aggregate matching function. With employment rigidities, the increase in

output following exogenous jump in productivity will produce a lower labor share in the short run.

4. Empirical Estimation

This section estimates the effect of globalization on the share of labor compensation in value-added of 18 U.S. manufacturing industries over the period from 1999 through 2009. The industries, shown in Table 2, are three-digit level industries as classified in the North American Industrial Classification System (NAICS).

We conduct a panel OLS regression analysis on equations of first-differenced variables that do not include a constant. The regressions thus allow whatever "trend" in the compensation share to be explained by right-hand-side variables, rather than by a trend. Moreover, the regressions eliminate the industry-specific effect on the labor share. The specification of the equations is:

$$(1)\quad Y_{i,t} - Y_{i,t-1} = \beta_1'(X_{i,t} - X_{i,t-1}) + \beta_2'(X_{i,t-1} - X_{i,t-2}) + (\epsilon_{i,t} - \epsilon_{i,t-1})$$

where the subscript i stands for industry and t for time period. $Y_{i,t}$ is the share of labor compensation (i.e., the sum of wages and salaries and supplemental benefits) in the value-added of industry i in year t. $\boldsymbol{X}$ is a vector of explanatory variables. β_1 and β_2 are vectors of coefficients, and ϵ is the error term.

4.1 Explanatory Variables

The explanatory variables are globalization indicators and other possible determinants of the labor share. Our regressions do not include the relative import price (i.e., import price/producer price index) and the relative export price as independent variables due to data

limitations.[21] Because import and export prices by NAIC classification are not available until 2005, including those relative prices in the regressions would have forced us to shorten the sample period to 2005-2009 instead of 1999-2009. To the extent that effect of those relative prices show up in import penetration and export share, however, excluding those two price variables is probably is not an omission that would seriously bias the estimation results.

Import penetration is measured as *imports/(total domestic shipments + imports – exports)* for the industry, or the share of imports in the domestic market. In a perfect-competition framework, an increase in import penetration lowers the labor share through the Stolper-Samuelson channel. In an imperfect-competition framework, a rise in import penetration will also lower the labor share in that industry because the decline in that industry's demand for labor undercuts labor's bargaining power in that industry.

Export share is measured as *exports/total domestic shipments* for the industry. In a perfect-competition framework, an increase in the export share of shipments in an industry may or may not increase the labor share in that industry through the Stolper-Samuelson channel. That is because, the expansion of an industry through exports will lower the average real wage in that industry, even as it may or may not increase the labor that industry employs. Thus, the labor share in that industry will rise only if the percentage increase in employment is higher than the percent decline in the average real wage in that industry. In an imperfect-competition framework, the labor share in an expanding industry is more likely to rise because the increase in that industry's demand for labor will tend to increase the bargaining power of labor.

Relative foreign employment is measured as *employment in U.S.-owned foreign affiliates relative to employment in their U.S. parents* for the industry as a whole. This variable is

[21] A significant and positive coefficient on the relative import price would suggest that a decrease in import prices lowers the labor share of income through the Stolper-Samuelson channel.

an (imperfect) indicator for the degree of offshoring and vertical integration in each industry. In the H-O framework, an increase in this variable indicates a decline in the demand for domestic labor, thereby leading to a decline in the labor share in the industry. In an imperfect-competition framework, however, the effect of a rise in the relative foreign employment on the labor share is ambiguous *a priori*. On the one hand, a rise in this indicator could portend the decline in labor's bargaining power, thereby leading to a decline in the labor share. However, if most jobs offshored are lower-skilled jobs, the average wage of the retained labor – the higher-skilled labor – will be higher than the average wage prevailing before those lower-skilled jobs were offshored. Moreover, as a company's rent rises due to offshoring of the lower-skilled jobs, the bargaining power of those retained higher-skilled (and less dispensable) workers could rise. If, following a rise in offshoring, the percentage rise in the average wage of retained workers is higher than the percentage decline in the number of jobs, that offshoring could lead to a rise in the labor share in the industry.

Degree of unionization is measured as U_i/L_i, where U_i is the number of union members in industry i, and L_i is the total number of workers in industry i. This variable is included to control for the effect on the labor share of barriers to enter the labor market in each industry and the negotiation power of the labor union in the industry. Everything else being equal, a higher degree of unionization is expected to have a positive effect on the labor share of income for two reasons. First, a higher barrier to entry makes it harder for real wages to adjust downward. Second, the stronger is labor's bargaining power, the harder will be for firms to lower real compensation for labor. Because union membership is not broken down by three-digit industries in NAICS until the year 2005, we use the average degree of unionization in all durable-goods

industries as a proxy for unionization in each durable-goods industry, and the average in all nondurable-goods industries as a proxy for unionization in each nondurable-goods industry.

FDI outflows/GDP is measured as *gross foreign direct investment outflows/GDP*. A higher level of this indicator is taken to mean that U.S. firms have increased the degree to which they resort to using lower-cost labor abroad to lower their production costs. (Of course, firms also increase their FDI outflows to create production facilities to meet demand for their products in foreign markets that do not affect the number and types of jobs in the United States.) This is likely to lower the labor share by reducing domestic workers' employment opportunities and by lowering labor's bargaining power.[22] Due to data limitations, we use the aggregate FDI outflows from all U.S. firms (including those in non-manufacturing industries) to the rest of the world, rather than FDI outflows from each industry.[23]

Productivity growth measures the growth rate of total factor productivity (TFP) in the industry. Growth in TFP (or, the Solow residual) is a better measure of output growth attributed to technical progress than growth in labor productivity, because the former is the part of output growth unexplained by growth in production input, while the latter is the sum of TFP growth and capital deepening.[24] TFP growth is included in our regression equations to control for the effect

[22] In our preliminary regressions, net FDI outflows were not statistically significant, so we decide to use gross outflows in the regressions. That net outflows did not work as well as gross outflows may stem from the fact that inflows do not all amount to an increase in labor's bargaining power, even if they do provide employment opportunities. For example, subsidiaries of Toyota and Honda set up operations in previously depressed locations in the United States and used non-unionized workers, offering real wages that are lower than U.S. carmakers.

[23] Aggregate outflows are reasonable because the trend in FDI outflow/GDP mainly measures the greater openness of foreign economies to foreign direct investment from the United States. Thus, the main drivers of the trend (though not fluctuations) in that ratio is likely to factors common to all U.S. manufacturing industries such as deregulation or other enhancement in investment climate/infrastructure abroad, the exchange rate, and economic growth rates.

[24] The effect of TFP growth on the labor share may be positive or negative depending on whether the source of the growth is labor-saving, labor-augmenting, or capital-augmenting technological progress. The effect of capital deepening on the labor share is negative if the elasticity of substitution between labor and capital is less than one.

of technical progress on the labor share. A significant and negative coefficient on this variable would suggest that technical progress is labor-saving.

Capacity utilization is the fraction of productive capacity that is operating in the industry. This variable is included to control for the influence of the business cycle on the labor share. Because firms tend to hoard labor in the initial phase of a downturn, a decrease in an industry's capacity utilization (and output) could increase the labor share of value-added in that industry for a while.

Year dummies: These are included to control for time-specific factors that may have affected the labor share independent of the effect of other regressors. Since year dummies will also capture cyclical effects on the labor share, we exclude capacity utilization from the regressions that include year dummies.

4.2 Data

Data for employee compensation by industry and value-added by industry are obtained from Bureau of Economic analysis. Data for unionization are from Current Population Survey, and Bureau of Labor Statistics. Data on imports and exports are from U.S. International Trade Commission. Data on shipment are from the Census Bureau. Capacity utilization data are from Federal Reserve Board of Governors. Multifactor productivity growth rates are from the NIPA Industry Data base, Bureau of Labor Statistics. Foreign direct investment flows and GDP are from the Bureau of Economic Analysis. Employments of foreign affiliates in three-digit industries (by NAICS classifications) are from Bureau of Economic Analysis.

As a result, the estimated effect of labor productivity on the labor share cannot be a good indicator of the effect of technology change per se.

4.3 Estimation Results

Tables 4 and 5 report the results of our regression analysis. Table 4 reports the results using capacity utilization (by industry) to control for the effect of the business cycle on the labor share. Table 5 reports the results of using year dummies to control for the business cycle. We present both Tables 4 and 5 because they complement each other: the former has the advantage of controlling for the difference in the degree of cyclicality in each industry, while the latter has the advantage of also controlling for the effect of macroeconomic shocks that vary from year to year.

On balance, we prefer the estimates in Table 5 for two reasons. First, many RHS variables (such as, import penetration, export share, TFP growth, and the relative foreign employment) are likely correlated with capacity utilization, so the coefficient estimates in Table 4 are affected by multicollinearity. Second, time dummies help to remove errors resulting from excluded macroeconomic shocks, which could be substantial at times.

Table 5 shows the following key results, all of which are consistent with *a priori* expectations:

Import penetration is estimated to have a negative effect on the labor share in the same year, but not after a one-year lag. The contemporaneous coefficient estimates all are of the expected sign, statistically significant, and very robust across different specifications in both Tables 5 and 4. The coefficient estimates on the contemporaneous import penetration ranged between 1.63 and 1.64 in Table 5 and 1.13 and 1.32 in Table 4. The coefficient estimate on the lagged import penetration is insignificant in all regressions in both tables. The coefficient estimate in Table 5 suggests that a one percentage-point *increase* in import penetration leads to

about 1.6 percentage-point *decrease* in the labor share of value-added in the manufacturing sector in the same year.

Given that import penetration in manufacturing increased by 5.1 percentage points between 1999 and 2009 (Table 2), even the average of the lower estimates of Table 4 (about 1.2) would suggest that, everything else being equal, the rise in import penetration lowered labor's compensation share in manufacturing by more than 6 percentage points over that period. In other words, the rise in import penetration contributed to over 80 percent of the 7.1 percentage-point decline in labor's share of value-added in manufacturing between 1999 and 2009.

Export share generally has a significant and positive effect on the labor share within one year. The coefficient on the contemporaneous export share is significant in all regressions in Table 5. (In Table 4, the coefficients on export share are also significant in the two regressions that do not include capacity utilization, but insignificant in regressions that include capacity utilization. This suggests that the latter result is due to the correlation between export share and capacity utilization.) The coefficient is estimated to be about 0.85 in Table 5, and about 0.7 in Table 4, suggesting a one percentage-point increase in the export share leads to an about 0.8 percentage-point increase in the labor share in the manufacturing sector. As for import penetration, a change in the export share does not have a significant effect on the change in the labor share after one year. Since the export share for the manufacturing sector increased 3.7 percentage points between 1999 and 2009, the estimates suggest that, everything else being equal, the rise in the export share increased the labor share of value-added in manufacturing by about 3 percentage points over that decade (Table 2).

Productivity growth has a statistically significant and negative effect on the labor share in the first year in most of the regressions. The contemporaneous coefficient estimate is

about -0.3 in all of the regressions in Table 5 (and about -0.2 in all three regressions in Table 4 that do not include capacity utilization). Those results suggest that a one percentage-point *increase* in the change in TFP growth leads to about 0.2 to 0.3 percentage-point *decrease* in the labor share in the manufacturing sector. In both tables, the lagged coefficient estimates are positive, but smaller (in absolute value) than the contemporaneous coefficients; moreover, and the lagged coefficient estimates are statistically insignificant in Table 5. Taken together, these results suggest that the negative effect of labor-saving technology progress on the labor share is generally larger in the short run than in the long run. This suggests that the increase in value-added due to TFP productivity growth goes toward paying capital first before it spills over to labor.

Our regression estimates suggest that TFP growth rate is not a major factor behind the sharp decline in the labor share of manufacturing value-added after 2000. This is because TFP growth in the manufacturing sector has been in a general decline since 1999, as opposed to its sustained rise in the previous decade: TFP growth in the manufacturing sector fell 2 percentage points between 1999 and 2007, after a 2.6 percentage-point gain between 1989 and 1999 (Table 2).[25]

The relative foreign employment is estimated to have a net positive effect on the labor share in two years. In Table 5, the contemporaneous coefficients are all about -0.1 (but statistically insignificant) in all regressions, while the lagged coefficients are about 0.4 (and statistically significant). In Table 4, the positive lagged effect is also larger than the negative contemporaneous effect: the contemporaneous coefficients are about -0.3 (and statistically

[25] We do not think it is appropriate to include the sharp fall in TFP growth between 2007 and 2009 in this comparison because TFP growth is highly pro-cyclical, and the U.S. economy was in a steep recession in 2008 and 2009.

significant) in all regressions, while the lagged coefficients are about 0.4 to 0.5 (and statistically significant).

Estimates in Table 5 suggest that a one-percentage *increase* in the change in the relative foreign employment leads to a roughly 0.3 percentage-point *net increase* in the labor share in manufacturing *after two years*. Even estimates in Table 4 suggest that that a one-percentage *increase* in the change in the relative foreign employment leads to a roughly 0.15 percentage-point *net increase* in the labor share in manufacturing *after two years*. This is an interesting result that lends support to the view advanced by some economists that the outsourcing of low-skilled jobs not only improves the pay of those high-skilled jobs retained at the parent companies but also create other better-paying jobs at home over time.[26] The net impact, suggested by the rise in the relative foreign employment (13.6 percentage points) between 1999 and 2009, is roughly a two-percentage-point net increase in the labor share of manufacturing value-added over that decade.

FDI outflow/GDP is estimated to have a negative effect on the labor share. In Table 5, the coefficients on the contemporaneous and lagged ratio are both negative. In regression (2), which does not include unionization, both contemporaneous and lagged coefficients are negative, quantitatively large (-5.4 and -3.0), and statistically significant. However, in regression (3), which includes unionization, both contemporaneous and lagged coefficients are smaller (-2.1, -0.2) and the lagged coefficient is insignificant. This may be in part attributable to the correlation between FDI outflows and unionization, as shown in Figure 5.

[26] For example, Mann (2003) argues "The globalization of software and IT services means that some IT jobs will be done abroad. But as more sectors of the economy and more businesses use the IT packages in the United States, high-skill jobs to design and tailor IT packages will increase in the IT sector, and jobs demanding the skills to use these IT packages effectively will diffuse throughout the economy," page 1.

Unlike other variables we discussed so far, the coefficient estimates in Table 4 are considerably different from those in Table 5. In Table 4, both contemporaneous and lagged coefficients are small and statistically insignificant. This may be because, given that FDI flows are highly susceptible to macroeconomic, regulatory, and political shocks, regressions in Table 5 (which include year dummies) thus have the advantage of allowing the effect of those shocks to be absorbed by year dummies. For example, the ratio fell sharply from 2004 to 2005 (2.7% to 0.3%) before it rebounded to 1.8% in 2006, mainly because of the tax holiday granted by the American Jobs Creation Act of 2004.

The preceding discussion suggests that regression (2) in Table 5 is most appropriate for making inferences. That regression suggests that a one-percentage-point increase in the FDI outflows ratio lowered the labor share in manufacturing industries by 8 percentage points over time. The FDI/GDP ratio had a net decline in our sample period, from 2.4% (1999) to 2.2% (2009), suggesting that this ratio did not contribute to the labor share's decline during that decade. However, this is an artifact of the especially high FDI outflows/GDP ratio in 1999 (Figure 5). If we use the average ratios in 1996-1999 and in 2006-2009, we see that average ratio rose by 0.7 percentage points (from 1.6% to 2.3%) between those two periods, suggesting FDI outflows lowered the labor share in manufacturing by about 5.6 percentage points (=0.7% x 8) from 1996 to 2009.

Unionization has a statistically insignificant effect on the labor share. In part, this could be due to the measurement error introduced by using the sector-wide average unionization as proxy for unionization in each industry. Perhaps more importantly, it could also be that unionization – which rises and falls with labor's bargaining power – is affected by the factors of globalization included in the regressions. Indeed, Table 6 shows that three of those independent

variables – import penetration, TFP growth rate, and the relative foreign employment – have a statistically significant and negative effect on unionization after one-year lag, while FDI outflows have a statistically significant and negative contemporaneous effect and a positive lagged effect on unionization.

5. Conclusion

This paper discusses how globalization may lower the labor share of national income, and presents empirical estimates of the effect of globalization on the share of labor compensation in value-added in U.S. manufacturing industries since 1999. Although the share of manufacturing output in the U.S economy has fallen to about 12 percent in 2011, our empirical findings are relevant for understanding the impact of globalization on the aggregate labor share. This is because, under the standard assumption that labor is mobile in the domestic economy over the long run, the impact of globalization on the employment and wages in the tradable sectors will necessarily have spill-over effects on the rest of the economy. In the U.S. case, where the entire manufacturing sector is shrinking partly due to globalization, unskilled workers displaced by globalization will necessarily move to jobs in the non-tradable sector that pay less than their previous jobs in the manufacturing sector.

Several of our findings are interesting. First, the rise in FDI outflows since 1999 contributed to lowering the labor share in manufacturing industries. Second, the rise in import penetration lowered the labor share in the manufacturing sector by over 6 percentage points, while the rise in the export share increased that share by about 3 percentage points, between 1999 and 2009. Third, an increase in the relative foreign employment lowered the labor share in the first year but increased the labor share in the second year, yielding to a small net increase in

the labor share in two years. A rough estimate based on our findings suggests that the increase in the relative foreign employment increased the labor share in manufacturing by about 2 percentage points between 1999 and 2009. Fourth, an increase in TFP growth had a negative effect on the labor share, suggesting that the technology shift has been skill-biased or labor-saving. If that technology shift stemmed from American firms trying to survive lower-priced imports, then globalization also could have lowered the labor share by inducing that shift toward labor-saving technology. Finally, unionization is not estimated to have a significant effect on the labor share, but auxiliary regressions suggest that could be because it is highly correlated with globalization indicators already included in main regressions.

Those results suggest that, although globalization seems to have a net negative effect on the labor share in the U.S. manufacturing sector so far, that effect may still turn positive in the future if economic conditions change sufficiently. Of course, other factors – especially technological shifts – may exert an even larger effect on the labor share to offset changes in the effect of globalization. Even if we hold all other factors constant, however, given the large disparity in economic fundamentals between the United States and many emerging economies, globalization's net effect on the US labor share is more likely to stay negative for decades.

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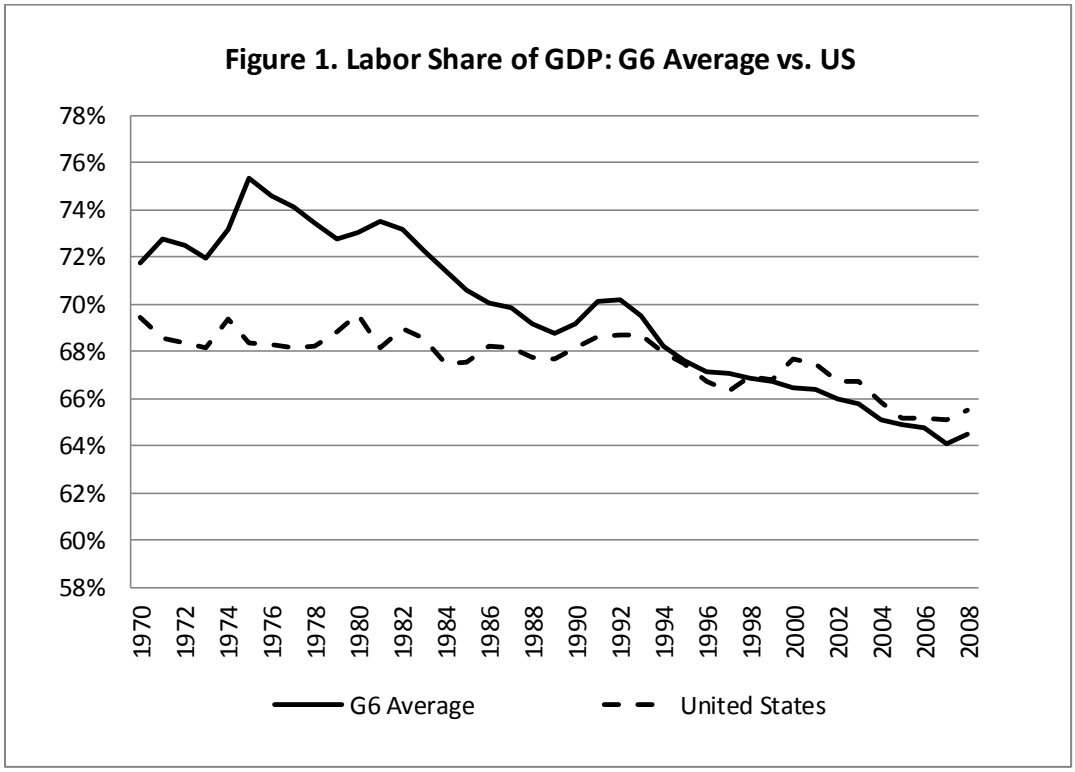
Figure 1. Labor Share of GDP: G6 Average vs. US
78%
76%
74%
72%
70%
68%
66%
64%
62%
60%
58%
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
G6 Average
United States

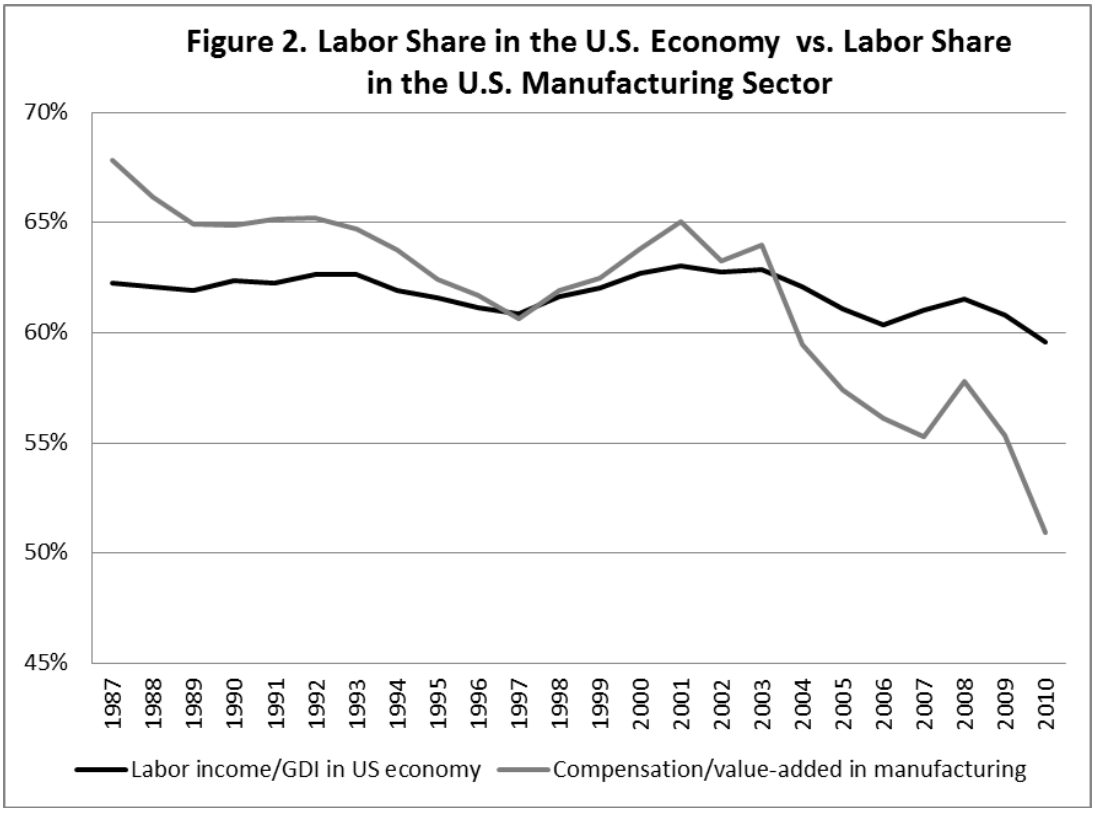
Figure 2. Labor Share in the U.S. Economy vs. Labor Share in the U.S. Manufacturing Sector
70%
65%
60%
55%
50%
45%
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Labor income/GDI in US economy
Compensation/value-added in manufacturing

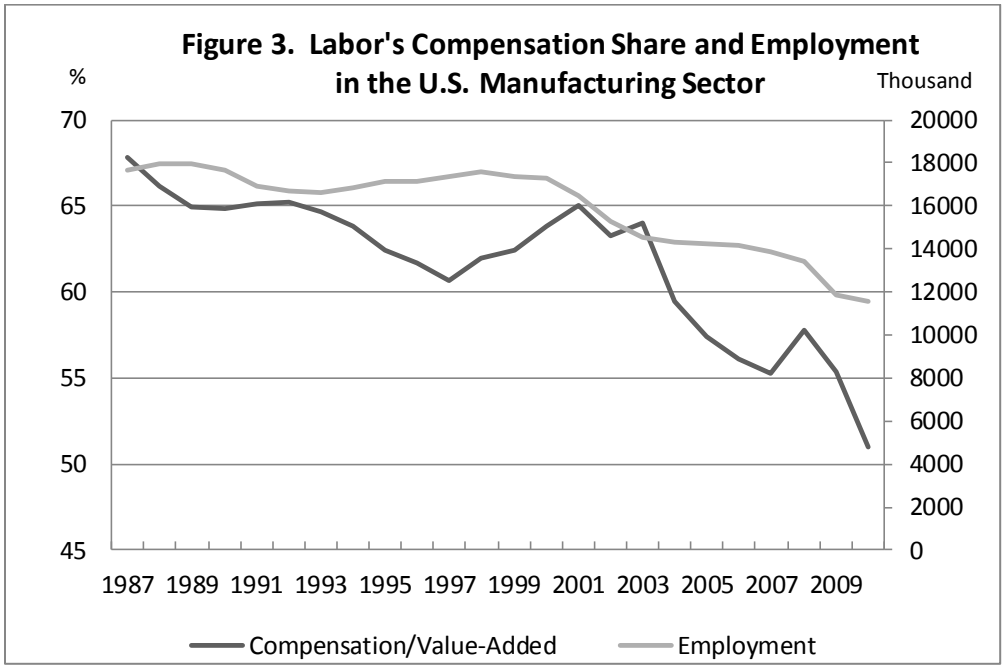
Figure 3. Labor's Compensation Share and Employment in the U.S. Manufacturing Sector
%
Thousand
70
65
60
55
50
45
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
Compensation/Value-Added
Employment

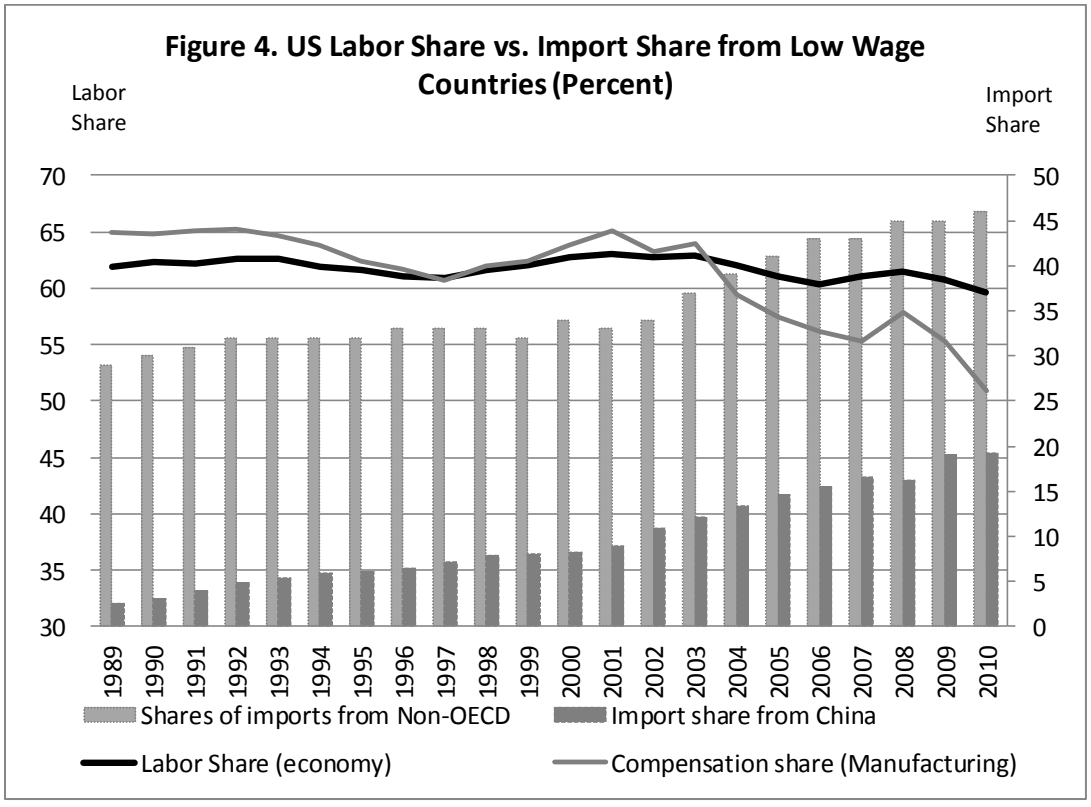
Figure 4. US Labor Share vs. Import Share from Low Wage Countries (Percent)
Labor Share
Import Share
70
65
60
55
50
45
40
35
30
50
45
40
35
30
25
20
15
10
5
0
1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Shares of imports from Non-OECD
Import share from China
Labor Share (economy)
Compensation share (Manufacturing)

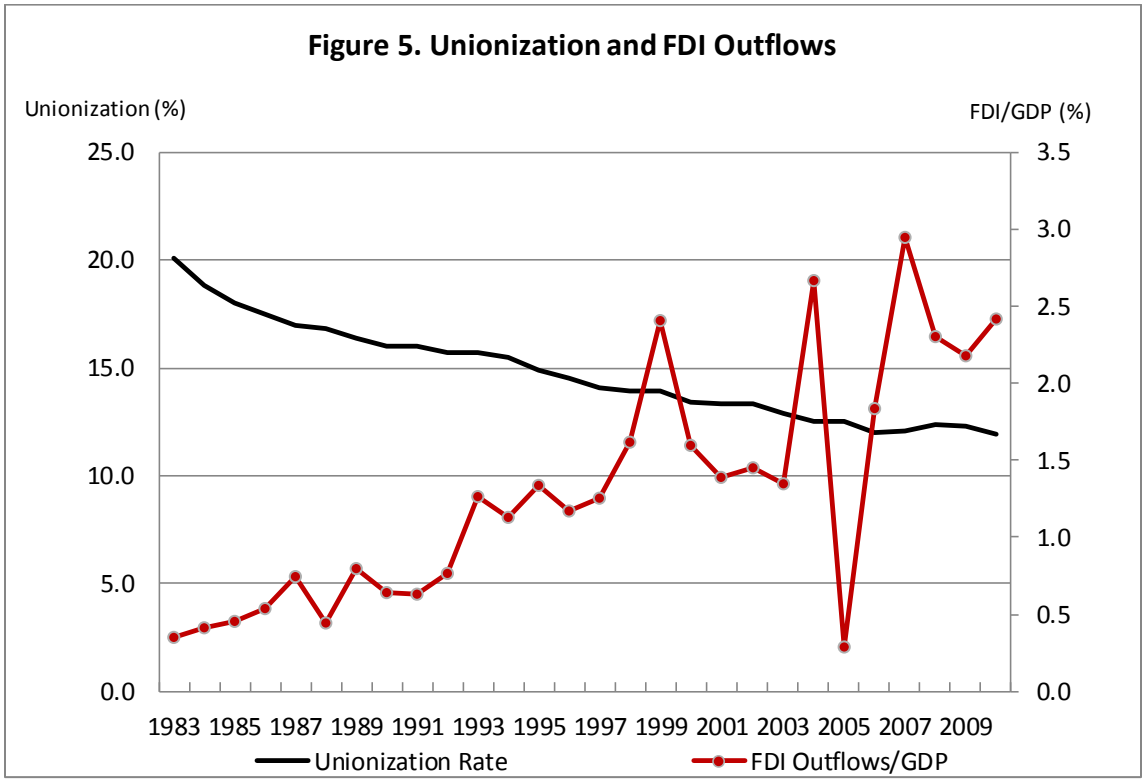

Table 1. Aggregate Labor Share of Income in Major OECD Economies (percent of GDP)

	1970	1980	1990	2000	2008	2009	2010
Australia	72.5	70.3	66.6	64.4	*n.a.*	*n.a.*	*n.a.*
Belgium	64.0	74.2	68.3	68.9	68.2	69.9	68.9
Canada	67.9	63.2	65.2	61.3	59.8	*n.a.*	*n.a.*
Finland	72.2	71.3	73.3	61.7	63.6	68.6	67.3
France	75.6	78.9	70.1	67.4	66.8	68.2	68.4
Germany	73.1	75.8	69.9	72.0	66.2	69.7	68.1
Italy	80.4	79.5	76.7	66.1	67.2	68.2	68.1
Japan	61.9	69.7	62.1	61.7	57.9	59.4	*n.a.*
Netherlands	72.6	76.3	69.2	68.5	66.6	70.2	68.5
Norway	70.0	64.4	63.3	54.5	51.6	58.1	56.4
Sweden	71.7	75.9	72.6	67.4	65.5	67.3	65.2
United Kingdom	71.6	71.2	71.2	70.1	69.0	71.4	71.3
United States	69.5	69.6	68.2	67.7	65.5	65.1	63.7

Source: OECD.

Table 2. Labor's Share of Value-added and Exposures to Globalization in Manufacturing Industries, 1999-2009 (percent)															
	Employee Compensation/ Value-added		Change	Import Penetration Ratio		Change	Exports as a percentage of shipments		Change	Employment in Foreign Affiliates/Em-ployment in U.S. Parents		Change	Change in TFP Growth Rate		
	1999	2009	1999-2009	1999	2009	1999-2009	1999	2009	1999-2009	1999	2009	1999-2009	1989-1999	1999-2007	2007-2009
Manufacturing	62.5	55.3	-7.1	20.6	25.7	5.1	14.4	18.1	3.7	25.1	38.7	13.6	2.6	-2.0	-14.7
Durable goods	70.6	68.4	-2.2	25.7	34.3	8.5	18.3	24.4	6.1	*n.a.*	*n.a.*	*n.a.*	*6.1*	-4.0	-22.5
Wood products	72.0	84.3	12.2	14.7	13.7	-1.0	4.9	6.1	1.2	4.3	3.8	-0.5	5.0	-10.3	-16.9
Nonmetallic mineral products	55.7	70.4	14.7	12.8	13.6	0.8	6.6	8.2	1.7	12.2	19.9	7.6	2.5	-2.2	-22.3
Primary Metals	72.8	73.2	0.3	20.9	29.7	8.8	11.3	22.6	11.2	11.5	30.0	18.5	1.9	0.2	-29.0
Fabricated metal products	65.5	68.8	3.3	9.1	13.6	4.4	7.5	9.8	2.3	8.7	8.3	-0.4	1.8	2.9	-26.8
Machinery	68.3	67.3	-1.0	25.9	32.4	6.5	26.2	35.9	9.7	23.7	39.2	15.5	-5.7	4.9	-24.4
Computer and electronic products	86.8	57.4	-29.4	38.3	55.6	17.4	29.4	32.8	3.3	43.7	61.7	18.0	18.7	-15.3	-17.1
Electrical equipment, appliances, and components	65.9	55.8	-10.1	26.4	40.6	14.2	18.7	25.6	6.9	45.2	55.6	10.4	5.6	-0.1	-21.9
Transportation equipment (autos and aircrafts)	68.9	98.0	29.2	26.1	31.5	5.4	18.6	28.3	9.6	41.4	62.9	21.5	6.0	-2.1	-25.4
Furniture and related products	69.7	76.6	6.9	15.8	26.5	10.7	3.4	5.2	1.7	5.4	6.8	1.4	2.5	-8.0	-21.4
Miscellaneous manufacturing	61.8	53.3	-8.6	35.9	43.1	7.2	15.4	24.6	9.2	22.3	43.9	21.6	1.1	-3.7	-7.1
Nondurable goods	50.9	41.2	-9.8	13.2	17.6	4.4	9.1	12.4	3.4	*n.a.*	*n.a.*	*n.a.*	-1.8	0.9	-7.7
Food and beverage and tobacco products	42.2	39.3	-2.8	4.9	6.7	1.9	5.4	6.4	1.0	28.9	40.8	11.9	-2.7	0.5	0.5
Textile mills and textile product mills	72.5	65.0	-7.5	13.9	32.1	18.2	9.2	18.2	8.9	6.5	9.6	3.1	-1.7	-12.9	-8.5
Apparel and leather and allied products	76.2	69.4	-6.8	54.8	86.6	31.8	14.1	24.6	10.5	14.7	52.2	37.4	-1.5	-23.0	5.1
Paper products	54.4	49.5	-4.9	10.3	11.5	1.2	8.8	11.7	2.9	21.9	24.3	2.5	0.1	0.5	-12.1
Printing and related support activities	85.8	87.1	1.3	3.8	5.9	2.1	4.6	6.8	2.2	3.6	11.1	7.5	0.6	1.6	-17.4
Petroleum and coal products	27.2	18.3	-8.8	12.3	14.1	1.8	3.6	8.3	4.7	32.9	35.4	2.5	-1.7	1.8	-3.2
Chemical products	44.1	37.1	-6.9	15.3	24.0	8.6	16.3	23.1	6.8	57.8	79.6	21.8	-0.6	2.9	-15.2
Plastics and rubber products	59.2	54.0	-5.2	9.2	15.6	6.4	8.6	12.0	3.4	17.9	31.6	13.7	2.3	-7.7	-14.5

Table 3. Labor's Share of Value-added, Degree of Unionization, and Exposures to Globalization in Manufacturing Industries, 2005-2009 (percent)

	Employee Compensation/ Value-added		Change	Percent of employed represented by unions		Change	Import Penetration Ratio		Change	Exports as a percentage of shipments		Change	Employment in Foreign Affiliates/Em-ployment in U.S. Parents		Change	Percent Change in (Import Price/PPI)
	2005	2009	2005-2009	2005	2009	2005-2009	2005	2009	2005-2009	2005	2009	2005-2009	2005	2009	2005-2009	2005-2009
Manufacturing	57.4	55.3	-2.1	13.7	11.9	-1.8	25.4	25.7	0.3	15.0	18.1	3.1	31.3	38.7	7.4	-5.1
Durable goods	67.4	68.4	1.0	14.0	11.7	-2.3	32.7	34.3	1.6	20.1	24.4	4.3	*n.a.*	*n.a.*		*n.a.*
Wood products	74.8	84.3	9.5	9.5	6.7	-2.8	18.0	13.7	-4.3	4.0	6.1	2.1	3.5	3.8	0.3	-9.9
Nonmetallic mineral products	62.2	70.4	8.2	18.1	17.8	-0.3	14.6	13.6	-1.0	6.0	8.2	2.2	15.4	19.9	4.4	4.6
Primary Metals	57.9	73.2	15.2	17.0	14.8	-2.2	26.8	29.7	2.8	13.5	22.6	9.1	20.2	30.0	9.8	38.5
Fabricated metal products	67.6	68.8	1.2	17.0	14.8	-2.2	13.3	13.6	0.3	8.0	9.8	1.8	8.7	8.3	-0.4	1.9
Machinery	69.8	67.3	-2.5	11.4	9.5	-1.9	34.7	32.4	-2.3	31.9	35.9	4.0	31.3	39.2	7.9	-2.3
Computer and electronic products	67.8	57.4	-10.4	4.0	3.7	-0.3	52.0	55.6	3.6	33.3	32.8	-0.5	48.9	61.7	12.8	-25.4
Electrical equipment, appliances, and components	71.1	55.8	-15.3	12.9	13.5	0.6	39.2	40.6	1.4	23.7	25.6	1.9	55.2	55.6	0.4	-3.1
Transportation equipment	0.7	0.6	-0.1	25.7	19.8	-5.9	31.8	31.5	-0.2	21.4	28.3	6.9	53.8	62.9	9.0	-8.9
Furniture and related products	68.8	76.6	7.8	6.4	7.3	0.9	23.6	26.5	3.0	3.4	5.2	1.8	5.7	6.8	1.2	-8.6
Miscellaneous manufacturing	59.6	53.3	-6.3	6.6	5.3	-1.3	41.1	43.1	2.0	20.2	24.6	4.4	31.9	43.9	12.0	-3.1
Nondurable goods	44.7	41.2	-3.5	13.1	12.2	-0.9	17.2	17.6	0.4	9.6	12.4	2.9	*n.a.*	*n.a.*		*n.a.*
Food and beverage and tobacco products	46.9	39.3	-7.6	0.2	0.2	0.0	6.4	6.7	0.3	4.9	6.4	1.5	36.4	40.8	4.4	8.5
Textile mills and textile product mills	67.0	65.0	-2.0	6.6	3.6	-3.0	23.9	32.1	8.2	14.0	18.2	4.2	5.8	9.6	3.8	-5.2
Apparel and leather and allied products	72.0	69.4	-2.5	6.6	3.6	-3.0	76.4	86.6	10.3	16.9	24.6	7.7	35.4	52.2	16.8	-11.5
Paper products	58.1	49.5	-8.6	14.2	14.4	0.2	13.2	11.5	-1.7	10.2	11.7	1.5	25.1	24.3	-0.8	-7.6
Printing and related support activities	87.1	87.1	-0.1	14.2	14.4	0.2	5.8	5.9	0.1	5.7	6.8	1.2	5.4	11.1	5.7	*n.a.*
Petroleum and coal products	10.0	18.3	8.4	25.9	19.6	-6.3	15.1	14.1	-1.0	3.7	8.3	4.6	34.5	35.4	1.0	10.3
Chemical products	44.8	37.1	-7.6	8.7	5.8	-2.9	21.0	24.0	3.0	18.7	23.1	4.4	65.3	79.6	14.4	8.5
Plastics and rubber products	62.0	54.0	-8.0	11.3	11.2	-0.1	13.4	15.6	2.2	9.4	12.0	2.6	22.4	31.6	9.2	-0.9

Table 4. Pooled OLS Regressions of Labor's Share in Manufacturing Industries						
Dependent Variable: Δ(Labor's Share in Value-Added); Sample Period: 1999-2009						
Industry capacity utilizations are used to control cyclical effects.						
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Δ Import Pentration	-1.172***	-1.136***	-1.152***	-1.317***	-1.253***	-1.302***
Δ Import Pentration (t-1)	0.243	0.19	0.149	0.309	0.212	0.315
Δ Export Share	0.57	0.589	0.571	0.662*	0.699*	0.666
Δ Export Share (t-1)	-0.448	-0.448	-0.424	-0.441	-0.412	-0.392
Δ TFP Growth Rate	-0.026	-0.041	-0.045	-0.220***	-0.219***	-0.218***
Δ TFP Growth Rate (t-1)	0.202**	0.199**	0.191*	0.110*	0.106*	0.109*
Δ Relative Foreign employment	-0.328**	-0.312**	-0.328**	-0.274*	-0.258*	-0.286*
Δ Relative Foreign Employment (t-1)	0.510***	0.507***	0.481***	0.434***	0.443***	0.430***
Δ (FDI Outflow/GDP)		-0.218	-0.258		-0.374	
Δ (FDI Outflow/GDP) (t-1)		0.151	0.262		0.041	
Δunionization			-0.514			-0.194
Δunionization (t-1)			0.098			0.235
Δ Capacity Utilization	-0.344*	-0.323	-0.314			
Δ Capacity Utilization (t-1)	0.009	-0.006	-0.006			
Number of observations	171	171	171	171	171	171
Ajusted R-Squared	0.241	0.236	0.229	0.231	0.228	0.223
Note: 1. * denotes P_value < 0.1, ** denotes P_value < 0.05, *** denotes P_value < 0.01. 2. Unionization in each						
durable (nondurable) industry is proxied by average unionization in durable (nondurable) industries.						

Table 5. Pooled OLS Regressions of Labor's Share in Manufacturing Industries				
Dependent Variable: Δ(Labor's Share in Value-Added); Sample Period: 1999-2009				
(Year dummies are used to control cyclical effects; Coefficient estimates on year dummies are suppressed.)				
Variable	(1)	(2)	(3)	(4)
Δ Import Pentration	-1.640***	-1.640***	-1.633***	-1.633***
Δ Import Pentration (t-1)	0.436	0.436	0.417	0.417
Δ Export Share	0.862**	0.862**	0.835*	0.835*
Δ Export Share (t-1)	0.311	0.311	0.319	0.319
Δ TFP Growth Rate	-0.335***	-0.335***	-0.326***	-0.326***
Δ TFP Growth Rate (t-1)	0.057	0.057	0.05	0.05
Δ Relative Foreign employment	-0.111	-0.111	-0.1	-0.1
Δ Relative Foreign Employment (t-1)	0.389**	0.389**	0.365**	0.365**
Δ (FDI Outflow/GDP)		-5.420**	-2.052**	
Δ (FDI Outflow/GDP) (t-1)		-3.009**	-0.198	
Δunionization			-1.228	-1.228
Δunionization (t-1)			-0.172	-0.172
Number of observations	171	171	171	171
Adjusted R-Squared	0.318	0.318	0.318	0.318
Note: 1. * denotes P_value < 0.1, ** denotes P_value < 0.05, *** denotes P_value < 0.01. 2. Unionization				
in each durable (nondurable) industry is proxied by average unionization in durable (nondurable) industries.				

Table 6. Pooled OLS Regressions of Unionization in Manufacturing Industries				
Dependent Variable: Δ unionization; sample period: 1999-2009				
Variable	(1)	(2)	(3)	(4)
Δ Import Pentration	-0.048	-0.042		-0.127***
Δ Import Pentration (t-1)	-0.106***	-0.108***	-0.119***	
Δ Export Share	-0.037	-0.042		-0.077**
Δ Export Share (t-1)	0.024	0.023	0.026	
Δ TFP Growth Rate	-0.005	0.004		0.007
Δ TFP Growth Rate (t-1)	-0.017**	-0.013**	-0.014**	
Δ Employment in Foreign Affiliate	-0.028	-0.03		-0.039
Δ Employment in Foreign Affiliate (t-1)	-0.051***	-0.048***	-0.054**	
Δ (FDI Outflow/GDP)	-0.126***	-0.119***		-0.121***
Δ (FDI Outflow/GDP) (t-1)	0.169***	0.174***	0.243***	
Δ Capacity Utilization	0.016			0.000
Δ Capacity Utilization (t-1)	-0.003		0.018	
Number of observations	171	171	190	190
Adjusted R-Squared	0.365	0.371	0.258	0.223
Note: 1. * denotes P_value < 0.1, ** denotes P_value < 0.05, *** denotes P_value < 0.01. 2. Unionization				
in each durable (nondurable) industry is proxied by average unionization in durable (nondurable) industries.				