

## IMMIGRANTS, SKILLS, AND WAGES: Measuring the Economic Gains from Immigration

by Giovanni Peri, Ph.D.\*

### EXECUTIVE SUMMARY

Foreign-born workers do not substitute perfectly for, and therefore do not compete with, most native-born workers. Rather, the complementary nature of the skills, occupations, and abilities of foreign-born workers increases the productivity of natives, stimulates investment, and enhances the choices available to consumers. As a result, immigration increases the average wages of all native-born workers, except those who do not have a high-school diploma. Even for the small and shrinking number of native-born workers without a high-school diploma, the decline in wages from immigration is much smaller than some have estimated. A well-balanced immigration policy that attracts foreign-born workers at both ends of the educational spectrum would maximize the economic benefits of immigration for the native-born and build on the traditional appeal of the United States as a country of destination for both highly skilled and less-skilled immigrants.

Among the findings of this report:

- Immigration raised the average wage of the native-born worker by 1.1 percent during the 1990s. Among native-born workers with a high-school diploma or more education, wages increased between 0.8 percent and 1.5 percent. Among native-born workers without a high-school diploma, wages declined by 1.2 percent.
- Most foreign-born workers either lack a high-school diploma or have at least a bachelor's degree, while most

native-born workers either have a high-school diploma or some college short of a four-year degree.

- Since workers with different levels of education perform different tasks and fill different roles in production, the majority of native-born workers (those with intermediate educational levels) experience benefits, more than competition, from foreign-born workers concentrated in high and low educational groups.
- Even among workers with the same level of formal education, the foreign-born tend to be employed in different occupations than U.S. natives. Less-educated foreign-born workers, for instance, are found mostly in agricultural and personal service jobs, while less-educated natives are found mostly in manufacturing and mining.
- The relatively large positive effect of highly skilled immigrants on the wages of native-born workers with a college degree or more is driven by the fact that creative, innovative, and complex professions benefit particularly from the complementarities brought by foreign-born scientists, engineers, and other highly skilled workers.
- Family reunification policies have served the purpose of keeping earlier immigrants favorable to new immigration, while purely economic considerations would lead them to turn against new immigrants in order to reduce competition for jobs.

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## INTRODUCTION

The recent political debate on immigration in the United States, as well as the academic literature on the issue, often depicts immigration as a large inflow of uneducated workers.<sup>1</sup> The emphasis has been on the low (and declining) average educational level of immigrants relative to the native-born, and on the negative impact that this inflow supposedly has on native workers (especially less educated ones) through wage competition. However, an accurate characterization of the impact of immigrants on U.S. wages and labor markets requires a more careful consideration of the distribution of education and skills among the foreign-born over the past three decades. In fact, foreign-born workers generally have a positive impact on the productivity and wages of native-born workers.

## MOST IMMIGRANTS ARE NOT “SUBSTITUTES” FOR NATIVE-BORN WORKERS

Immigrants are not simply concentrated among less-educated workers (those without a high-school diploma), but also among highly educated workers (those with a bachelor’s or graduate degree). In contrast, immigrants represent a relatively small share of workers in intermediate educational groups (high-school graduates and those with some college). While the large inflow of uneducated workers has attracted the most media attention, there is an even larger inflow, in proportional terms, of highly educated professionals, scientists, and business leaders. In 2003, the foreign-born share of PhDs working in science, engineering, and technology was 30 percent, while the foreign-born share of workers without a high-school diploma was 23 percent. Conversely, 8 percent of workers with only a high-school diploma were foreign-born. Among native-born workers, 60 percent had a high-school diploma or junior-college degree, but not a four-year college degree.

Since workers with different levels of education perform different tasks and fill different roles in production, the majority of native-born workers (those with intermediate educational levels) experience benefits, more than competition, from foreign-born workers concentrated in high and low educational groups. For instance, a high-tech company

in San Jose has many technical employees and programmers (likely to be native-born workers with a junior-college degree) who rely upon creative and talented engineers with PhDs (likely to be foreign-born) for technical leadership. In addition, all of these employees rely upon gardeners, janitors, and nannies (also likely to be foreign-born) to provide affordable personal services. Such complementarities among foreign-born and native-born workers increase the productivity of the company and, in particular, the productivity of its native-born employees. This, in turn, translates into higher wages given that, in a competitive labor market, wages are equal to workers’ marginal productivity.

Even among workers with the same level of formal education, the foreign-born tend to be employed in different occupations than U.S. natives. Less-educated foreign-born workers, for instance, are found mostly in agricultural and personal-service jobs, while less-educated natives are found mostly in manufacturing and mining. There is little wage competition between these groups of workers. Moreover, in jobs that do not require formal education, foreign-born workers often have somewhat different skills from natives and produce services that are not identical to those produced by natives, even within the same occupation. For instance, in jobs such as cook, baker, tailor, artist, singer, dancer, and architect, differences in taste, style, and design differentiate the foreign-born and their services. Foreign-born workers do not substitute perfectly for, and therefore do not compete with, most native-born workers. Rather, complementarities in the skills, occupations, and abilities of foreign-born workers increase the productivity of natives and enhance the choices available to consumers.

The inflow of immigrants with their unique array of skills also introduces a new set of opportunities for companies and investors in the United States. Capital follows economic opportunity, and the personal abilities and skills of immigrants generate opportunities for investment and the creation of new businesses. In economic terms, a larger labor force increases the productivity of the existing capital stock and induces new investment in response to higher returns. The long-term economic impact of immigration cannot be accurately gauged without accounting for this dynamic.

<sup>1</sup> See George J. Borjas, *Heaven’s Door: Immigration Policy and the American Economy*. Princeton, NJ: Princeton University Press, 1999.

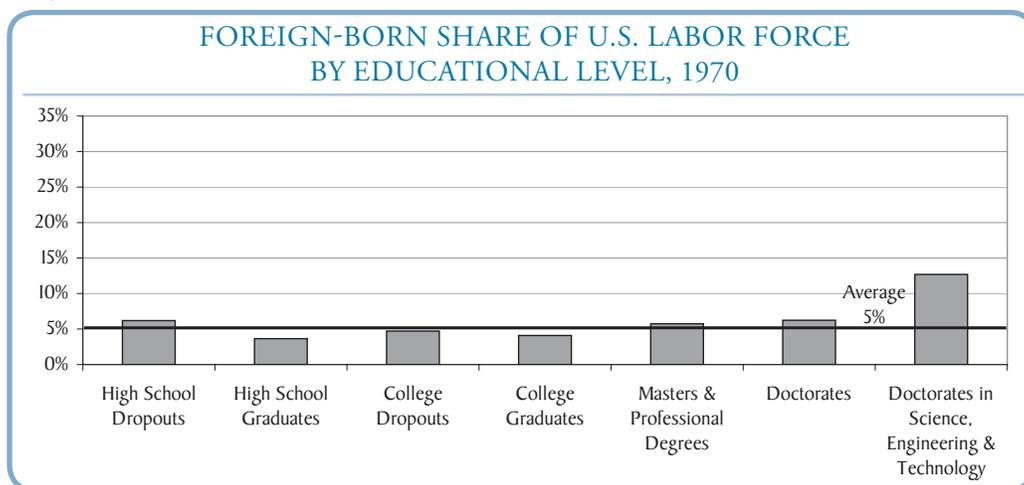
## IMMIGRANTS “COMPLEMENT” THE NATIVE-BORN IN EDUCATIONAL ATTAINMENT

The United States has been a magnet for international migrants since its creation as an independent country. In the post-World War II period, immigrants to the United States have had the distinctive feature of being concentrated among workers with both high and low levels of education (with fewer in intermediate educational groups).

Figure 1 represents the relative distribution of the foreign-born among workers in seven educational categories as

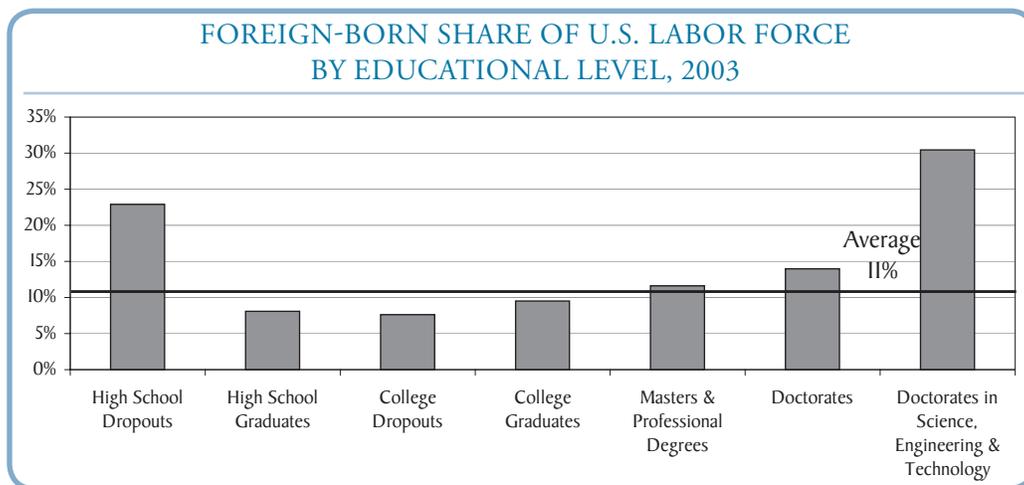
measured in the 1970 Census,<sup>2</sup> while Figure 2 represents the same distribution in 2003 as measured by the American Community Survey.<sup>3</sup> The overall share of the foreign-born among the working population age 17-65 rose from 5 percent in 1970 to 11 percent in 2003. In both years, the distribution of foreign-born workers across schooling groups had a characteristic “U” shape: higher in the “extreme” groups (those without a high-school diploma or with a college degree or more) and lower in the “intermediate” groups (those with only a high-school diploma or some college). However, the U-shape of this distribution was far more prominent in 2003 than in 1970. The increase in the foreign-born share of workers in the “extreme” groups was

Figure 1:



Source: 1970 Census.

Figure 2:



Source: 2003 American Community Survey.

<sup>2</sup> Author’s calculations based on IPUMS data from Steven Ruggles & Matthew Sobek, et al., Integrated Public Use Microdata Series: Version 3.0. Minneapolis: Historical Census Projects, University of Minnesota, 2006.

<sup>3</sup> Author’s calculations based on data from the 2003 American Community Survey.

much greater than the increase in the foreign-born share of the labor force as a whole during this period. Between 1970 and 2003, the foreign-born share of workers without a high-school diploma rose from 6.2 percent to 23 percent, while the foreign-born share of those with a doctorate in science, engineering, or technology rose from 12.6 percent to 30 percent.

At the same time, the educational attainment of the native-born evolved differently. Among native-born workers, the share without a high-school diploma decreased from 37 percent in 1970 to 12 percent in 2003, while the share with a college degree or more increased from 13 percent to about 30 percent. Yet, even though the native-born became more educated during this period, the majority (about 60 percent) occupied “intermediate” educational groups in 2003. In other words, the inflow of foreign-born workers between 1970 and 2003 occurred predominantly in those educational groups where native-born workers were fewer. This suggests that, if workers in different educational groups are not perfect substitutes for each other, and if all groups produce valuable services, then the majority of native workers in 2003 received beneficial complementary effects from the presence of foreign-born workers.

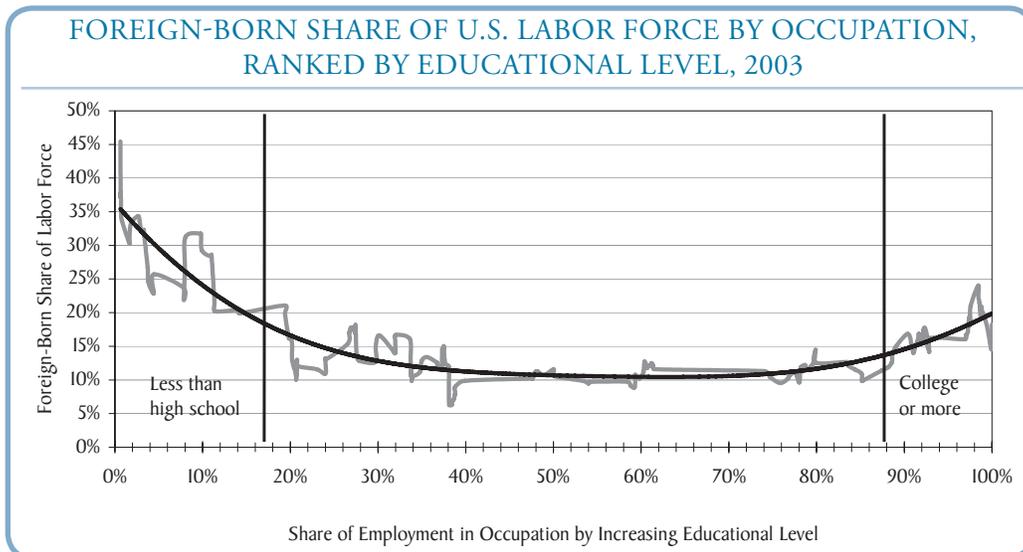
### IMMIGRANTS “COMPLEMENT” THE NATIVE-BORN IN SKILLS

Some observers argue that native-born workers in the two “extreme” educational groups might be disadvantaged by competition from foreign-born workers. However, labor is

a more differentiated factor of production than differences in education alone would suggest. Even within a particular educational group, different occupations require different skills and cannot be considered perfectly substitutable for one another. Native and foreign-born workers are distributed in different ways across occupations even within the same educational group.

This is illustrated in Figure 3. The grey line, produced using data from the 2003 American Community Survey, represents the share of foreign-born workers (on the vertical axis) in each of 183 occupations, arrayed from left to right by the increasing average level of education in each occupation. In addition, each occupation fills a space on the horizontal axis proportional to its share of total employment. The black line is the curve that best fits the overall distribution of foreign-born workers across occupations. The two vertical lines separate those occupations that, on average, require less than a high-school diploma and those that require a college degree or more. The share of foreign-born workers becomes higher at the extreme ends of the spectrum. Between the two vertical lines, the percentage of foreign-born workers is rather flat. Occupations such as plaster-mason, cleaner, and gardener, at the very low end of the distribution, have foreign-born shares above 30 percent. Similarly, biological scientists, physicists, surgeons, and dentists, at the very high end of the distribution, have foreign-born shares of around 20 percent or more. In occupations along the middle of the distribution, the foreign-born share is only about 10 percent.

Figure 3:



Source: 2003 American Community Survey.

As Figure 3 reveals, the foreign-born are concentrated in two types of occupations. At the low end of the distribution are occupations progressively abandoned by natives, who are increasing their educational level. At the very top end of the distribution are occupations in which talent, uncommon skills, and creativity are needed. Since the native-born do not have a monopoly on talent (which is probably randomly distributed throughout the world), a large share of foreign-born individuals end up filling this latter group of jobs. Arguably, foreign-born workers in neither of these two groups could easily be replaced by natives were immigration to come to a halt. More importantly, it is not clear that natives would be better off as a whole even if they did replace foreign-born workers. The U-shaped distribution of skills among the foreign-born implies that immigrants do not compete for jobs in occupations where most natives are employed, but supply skills that are complementary to those of the majority of the native-born population.

## IMMIGRATION GENERALLY INCREASES WAGES FOR THE NATIVE-BORN

While immigration may turn out to be good for the majority of native workers, it has been argued that the wages of native-born gardeners, masons, scientists, etc. suffer from the increased competition produced by the large inflows of foreign-born workers into these occupations. This has been the concern of some economists who have focused on the isolated effects of immigration on specific occupations or skill groups (typically the less educated). However, when the “complementary” distribution of foreign-born workers across occupations is taken into account, it becomes apparent that immigration has an average positive impact on wages. As a result of immigration, wages decreased by 1.2 percent in real terms during the 1990s among native-born workers without a high-school diploma (who represented only 12 percent of native-born work-

ers in 2003). But, the wages of all other native-born workers increased between 0.8 percent and 1.5 percent due to the same immigration inflow, generating a gain of about 1.1 percent in the average wage of the native-born worker {Figure 4}.

There is a long tradition among economists of studying the impact of immigration on U.S. wages.<sup>4</sup> The literature on this topic has grown larger over the past two decades as the number of immigrants increased, data became more available and detailed, and statistical techniques improved. Rather than yielding a consensus, the recent economic research has shaped two divergent views. One, led by Harvard economist George Borjas,<sup>5</sup> stresses the negative impact of immigration on wages, specifically the wages of workers with less education. This viewpoint emphasizes that immigration greatly increases the labor supply, especially of less-skilled workers, and thereby significantly decreases their relative wages. The alternative view, entertained by University of California, Berkeley, economist David Card<sup>6</sup> and his coauthors, analyzes local labor markets, mainly in cities or states, which are characterized by large variations in the share of immigrants. This analysis finds no evidence of any negative effect of immigration on the wages or on employment levels of less-educated native-born workers. The debate between these two camps remains active and unresolved due to intricate issues such as the presence of unobservable effects (such as productivity shocks that affect immigration and wages in cities and are hard to observe and isolate), causality (are the correlations between wages and immigration really indications of a causal effect?), and the choice of an appropriate unit of analysis (local vs. national).

Rather than taking a side in this debate, the analysis in this paper introduces some new elements overlooked by the previous literature. This analysis uses statistical techniques similar to those of Borjas and, like the Borjas “school,” examines the U.S. labor market as a whole. But the

<sup>4</sup> See Jean B. Grossman, “The Substitutability of Natives and Immigrants in Production,” *Review of Economics & Statistics* 64(4), 1982, p. 596-603; David E. Card, “The Impact of the Mariel Boatlift on the Miami Labor Market,” *Industrial & Labor Relations Review* 43(2), 1990, p. 245-257; Joseph J. Altonji & David Card, “The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives,” in John M. Abowd & Richard Freeman, eds., *Immigration, Trade and the Labor Market*. Chicago, IL: University of Chicago Press, 1991.

<sup>5</sup> See George J. Borjas, “The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market,” *Quarterly Journal of Economics* 118(4), 2003, p. 1335-1374; George J. Borjas & Lawrence F. Katz, *The Evolution of the Mexican-Born Workforce in the United States* (Working Paper No. 11281). Cambridge, MA: National Bureau of Economic Research, April 2005.

<sup>6</sup> See David Card, “Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration,” *Journal of Labor Economics* 19, 2001, p. 22-64; David Card & John E. DiNardo, *Do Immigrant Inflows Lead to Native Outflows?* (Working Paper No. 7578). Cambridge, MA: National Bureau of Economic Research, March 2000.

Figure 4:

	Change in Real Wages Using	
	Our Approach <sup>7</sup>	Borjas Approach
All Native-Born Workers	+ 1.10%	-1.3%
Native-Born Workers...		
...without a High School Diploma	-1.2%	-7.0%
...with a High School Diploma	+0.8%	-0.7%
...with Some College	+1.3%	-0.3%
...with a College Degree or More	+1.5%	-0.1%

analysis differs from the Borjas approach in three ways by: (1) accounting for the different occupational distribution of native and foreign-born workers within the same educational group (which more accurately gauges the “complementary” effects of immigration); (2) allowing investments to follow opportunities (with the presence of more workers stimulating the creation of new businesses); and (3) calculating the overall effect of immigrants on natives’ wages (factoring in the “complementary” distribution of foreign-born workers across occupations and educational groups). Because immigrants stimulate investment, have skill sets and educational levels that complement those of natives, and do not compete for the same jobs as most natives, this analysis finds that immigration increased the average wages of all native-born workers in the 1990s except those who did not have a high-school diploma (whereas the traditional Borjas approach finds a decrease among workers in all educational groups). Even for native-born workers without a high-school diploma, the decline in wages from immigration was much smaller than the Borjas approach suggests {Figure 4}.

### NEW IMMIGRANTS AND EARLIER IMMIGRANTS

There is one group whose wages have suffered the most from the arrival of new immigrants: those immigrants who are already here. Since earlier immigrants are more similar to new immigrants in their educational composition

and occupational choices, they face greater job competition from the newly arrived and may experience a stronger negative impact on their wages. But surveys and casual observation show that earlier immigrants are usually the most favorable to relaxing current limits on immigration.<sup>8</sup> This may seem puzzling from an economic point of view. But, since most of the foreign-born enter the country thanks to family reunification (especially among the less-educated groups), immigrants who are already here are happy to suffer the loss of a few percentage points in their wages in order to have spouses, siblings, and other relatives join them. The personal benefits offsets the economic losses. This implies that family reunification policies have served the purpose of keeping earlier immigrants favorable to new immigration, while purely economic considerations would lead them to turn against new immigrants in order to reduce competition for jobs.

### THE IMPORTANCE OF HIGHLY SKILLED IMMIGRANTS

The relatively large positive effect of immigrants on the wages of native-born workers with a college degree or more is driven by the fact that creative, innovative, and complex professions benefit particularly from the complementarities brought by foreign-born scientists, engineers, and other highly skilled workers. A team of engineers may have greater productivity than an engineer working in isolation, implying that a foreign-born engineer may increase the productivity of native-born team members. Moreover, the analysis in this paper probably does not capture the largest share of the positive effects brought by foreign-born professionals. Technological and scientific innovation is the acknowledged engine of U.S. economic growth<sup>9</sup> and human talent is the main input in generating this growth. The effect of innovation on productivity, however, accrues over time and hence will be fully realized only in the future. In addition, technological progress and innovation increase the productivity of the U.S. economy as a whole and therefore raise wages for all workers.

<sup>7</sup> For a detailed description of this analysis, see Gianmarco Ottaviano & Giovanni Peri, *Rethinking the Gains from Immigration: Theory and Evidence from the U.S.*, January 2006, available at [http://www.econ.ucdavis.edu/faculty/gperi/Papers/perott\\_AER.pdf](http://www.econ.ucdavis.edu/faculty/gperi/Papers/perott_AER.pdf).

<sup>8</sup> See Timothy J. Hatton & Jeffrey G. Williamson, *A Dual Policy Paradox: Why Have Trade and Immigration Policies Always Differed in Labor-Scarce Economies?* (Working Paper No. 11866). Cambridge, MA: National Bureau of Economic Research, December 2005.

<sup>9</sup> See Robert M. Solow, “A Contribution to the Theory of Economic Growth,” *Quarterly Journal of Economics* 70, 1956, p. 65-94; Paul M. Romer, “Endogenous Technological Change,” *Journal of Political Economy* 98(5), 1990, p.71-102; Philippe Aghion & Peter Howitt, “A Model of Growth Through Creative Destruction,” *Econometrica* 60(2), 1992, p. 323-51.

The United States has the enormous international advantage of being able to attract talent in science, technology, and engineering from all over the world to its most prestigious institutions. That would be very hard to replace. The country is certainly better off by having the whole world as a potential supplier of highly talented individuals rather than only the native-born. In 2003, for example, between 30 percent and 50 percent of all doctorates from U.S. universities in disciplines such as physics, mathematics, computer science, and engineering were awarded to foreign-born students. These percentages were even higher in the top 50 universities.<sup>10</sup> This “brain flow” of highly talented professionals to the United States currently originates from Asia (mainly China and India), as well as Canada and Europe.<sup>11</sup> As these countries put in place countermeasures to attract or re-attract talented professionals, the United States faces greater international competition and should not introduce new hurdles to their entry into this country.

these jobs with foreign-born workers is an efficient way of keeping the cost of these services moderate without hurting employment options for natives. At the same time, the United States must continue to attract the most highly educated people from around the world to maintain its economic, technological, and scientific leadership.

Attracting immigrants at both ends of the educational spectrum would maximize the economic benefits of immigration for the native-born and build on the traditional appeal of the United States as a country of destination for both groups of foreign-born workers. It would be most beneficial to the U.S. economy and easier to justify on economic grounds if a guest worker program for less-skilled workers were coupled with reform of the H-1B program to ease and increase the entry of highly skilled professionals. This would enhance the “complementary” distribution of immigrants across occupations and educational groups, and lessen the concern of natives about immigrants lowering the average educational level of the workforce and increasing fiscal burdens for U.S. citizens. A balanced inflow of foreign-born workers at the two extremes of the educational and occupational spectrum also would probably encounter less political opposition because any adverse effect on the wages of less-skilled natives would be lessened.

## IMPLICATIONS FOR IMMIGRATION POLICY

The large majority of native-born workers have received positive wage benefits from immigration to the United States. The native-born are becoming progressively better educated, while still demanding agricultural products and personal, cleaning, cooking, and gardening services. Filling

<sup>10</sup> Statistics provided to the author by the National Science Foundation from the Survey of Earned Doctorates, 1967-2003.

<sup>11</sup> See European Economic Advisory Group at CESifo (Munich), *Report on the European Economy* 2003.

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